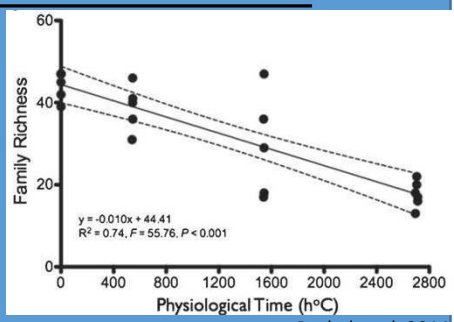
What's eating you?

Using Next Generation Sequencing in Forensic Science

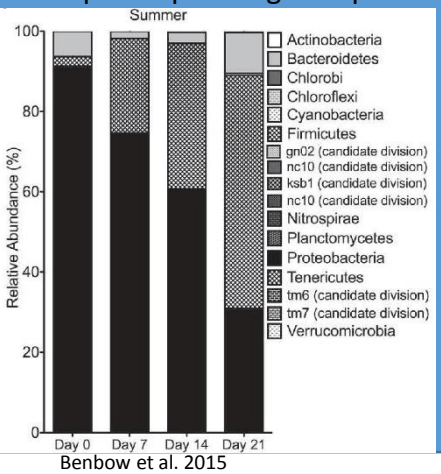
Upon death, a carcass is scavenged by many organisms including vertebrates, insects and microbes. It is theorized that some microbes may even release chemicals to influence the behavior of other organisms. Current research shows how Next Generation technology will aid our understanding of decomposition in may ways.

When someone or something dies, what do the microbes do?

According to Pechal et al. (2014), who used a metagenomics approach, the bacterial diversity on a carcass decreases over time, likely due to competition or insect effects. The microbial community on a carcass does provide clues about the time of death based upon the species richness. This data can be analyzed at different taxonomic levels, but deeper sequencing is required for lower taxonomic levels.



Pechal et al. 2014



Benbow et al. 2015

A similar study using metagenomics in a freshwater stream found the abundances of two bacterial phyla inversely related over the course of the decomposition. This relationship did not vary between summer and winter (Benbow et al. 2015), though the decomposition in the winter took more than two times longer. Next Generation Sequencing technology provides an useful platform for the comparison of bacterial abundance at the phylum level.

Small package, Big Effect

Microbes have also been shown to influence the behavior of other species through chemical cues. Burkepile et al. (2006) found that bacterial laden fish (fish left outside too long) repulsed crabs while Ma et al. (2012) found that a bacteria secreted from the salivary glands of a fly actually attracted other flies. While Ma et al. (2012) was able to identify a compound that attracts flies and may come from the bacteria, further metabolomic and transcriptomic studies are needed to illuminate which compounds are effecting scavenger behavior and under what conditions are they produced.

Summary

- Metagenomics of bacterial communities is developing as a useful tool for forensic science by indicating time of death
- Bacteria are also influencing carcass degradation by attracting some scavengers while repelling others, but further research is required to know when, how and why

References

Benbow et al. 2015 J Forensic Sci 60 (6)

Burkepile et al. 2006 Ecology 87:2821–2831

Ma et al. 2012 The ISME Journal 6(7):1356-66

Pechal et al. 2014 Int J Legal Med 128:193–205